Reply to Office Action of June 23, 2004   Appl. No.: 09/785,884
Amendment Dated: September 13, 2004   Attorney Docket No.: CSCO-002/94701

Listing of Claims

1   1. (Original) A method of processing a plurality of keep-alive messages generated by

2   a corresponding plurality of end systems, each of said plurality of keep-alive messages being

3   designed to request the status of a corresponding point to point (PPP) session implemented

4   on a communication network, said method comprising:

5   receiving in an aggregation device said plurality of keep-alive messages;

6   generating in said aggregation device an aggregated request packet which indicates

7   that the status of said PPP sessions is requested; and

8   sending said aggregated request packet on said communication network to a peer

9   aggregation device.

1   2. (Original) The method of claim 1, further comprising:

2   receiving said aggregated request packet in said peer aggregation device;

3   indicating the status of said plurality of sessions in an aggregated reply packet; and

4   sending said aggregated reply packet to said aggregation device.

1   3. (Original) The method of claim 1, further comprising receiving in said aggregation

2   device an aggregated reply packet from said peer aggregation device, wherein said aggregated

3   reply packet indicates the status of at least some of said plurality of PPP sessions.

1   4. (Presently Amended) The method of claim 3, further comprising sending <u>from said</u>

2   <u>aggregation device</u> a proxy keep-alive reply message to one of said plurality of end systems

3   originating a corresponding one of said keep alive-messages without waiting for said

4   aggregated reply packet.

1   5. (Original) The method of claim 4, further comprising:

2   maintaining a remote status table in said aggregation device, wherein said remote

3   status table indicates the status of sessions supported by said aggregation device;

4   updating said remote status table with the information in said aggregated reply packet;

5   and

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6   generating said proxy keep-alive reply according to said remote status table.

1   6. (Original) The method of claim 5, wherein said proxy keep-alive message indicates
2   that the corresponding session is alive/OK when a first keep-alive message is received for the
3   corresponding session.

1   7. (Original) The method of claim 6, further comprising initializing the status of each
2   of said session to alive/OK such that said proxy keep-alive message in response to said first
3   keep-alive message indicates alive/OK status.

1   8.   (Original) The method of claim 1, wherein said communication network is
2   implemented using one of frame relay, ATM and IP networks.

1   9.   (Original) The method of claim 1, wherein said aggregation device is one of a
2   network access server and home gateway.

1   10. (Original) A method of processing an aggregated request packet in an aggregation
2   device, wherein said aggregated request packet indicates that the status of a plurality of point-
3   to-point sessions are requested, said method comprising:
4   examining said aggregated request packet to determine said plurality of point-to-point
5   sessions;
6   determining the status of each of said plurality of point-to-point sessions;
7   generating an aggregated reply packet indicating the status of said plurality of point-to-
8   point sessions; and
9   sending said aggregated reply packet to said peer aggregation device.

1   11. (Original) The method of claim 10, wherein said determining comprises accessing
2   a local status table which contains the status information of at least some of said plurality of
3   point-to-point sessions.

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1   12. (Original) The method of claim 10, wherein said generating comprises including

2   a client magic number associated with each of said plurality of point-to-point sessions.

1   13. (Original) The method of claim 10, wherein said generating comprises setting a

2   bit to one logical value to indicate that a corresponding one of said plurality of sessions is

3   OK/alive, and to another logical value to indicate that said corresponding one of said plurality

4   of session not OK/alive.

1   14. (Original) The method of claim 10, wherein said aggregation device comprises

2   one of a network access server (NAS) and a home gateway implemented in a communication

3   network.

1   15. (Original) An aggregation device for processing a plurality of keep-alive messages

2   generated by a corresponding plurality of end systems, each of said plurality of keep-alive

3   messages being designed to request the status of a corresponding point to point (PPP) session

4   implemented on a communication network, said aggregation device comprising:

5   an input interface receiving said plurality of keep-alive messages;

6   a message aggregator coupled to said input interface, said message aggregator

7   examining said plurality of message and generating data according to a format indicating that

8   the status of said PPP sessions is requested; and

9   an output interface sending an aggregated request packet on said communication

10   network to a peer aggregation device, said aggregated request packet containing said data

11   generated by said message aggregator.

1   16. (Original) The aggregation device of claim 15, further comprising an encapsulator

2   encapsulating said data in a packet suitable for transmission on said communication network.

1   17. (Original) The aggregation device of claim 16, further comprising:

2   a remote status table indicating the status of sessions supported by said aggregation

3   device; and

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4   a de-aggregator receiving an aggregated reply packet from said peer aggregation

5   device, wherein said aggregated reply packet indicates the status of at least some of said

6   plurality of PPP sessions, said de-aggregator updating said remote status table with the

7   information in said aggregated reply packet.

1   18. (Original) The aggregation device of claim 17, further comprising a proxy reply

2   unit sending a proxy keep-alive reply message to one of said plurality of end systems

3   originating a corresponding one of said keep alive-messages without waiting for said

4   aggregated reply packet.

1   19. (Original) The invention of claim 18, wherein said aggregation device comprises

2   a network access server.

1   20. (Original) The aggregation device of claim 18, wherein said aggregated request

2   packet contains a magic number related to each of the corresponding sessions.

1   21. (Original) An aggregation device for processing a plurality of keep-alive messages

2   generated by a corresponding plurality of end systems, each of said plurality of keep-alive

3   messages being designed to request the status of a corresponding point to point (PPP) session

4   implemented on a communication network, said aggregation device comprising:

5   first means for receiving said plurality of keep-alive messages;

6   means for generating an aggregated request packet which indicates that the status of

7   said PPP sessions is requested; and

8   means for sending said aggregated request packet on said communication network to

9   a peer aggregation device.

1   22. (Original) The aggregation device of claim 21, further comprising second means

2   for receiving an aggregated reply packet from said peer aggregation device, wherein said

3   aggregated reply packet indicates the status of at least some of said plurality of PPP sessions.

1   23. (Original) The aggregation device of claim 22, further comprising means for

2   sending a proxy keep-alive reply message to one of said plurality of end systems originating

3   a corresponding one of said keep alive-messages without waiting for said aggregated reply

4   packet.

1   24. (Original) The aggregation device of claim 23, further comprising:

2   means for maintaining a remote status table in said aggregation device, wherein said

3   remote status table indicates the status of sessions supported by said aggregation device;

4   means for updating said remote status table with the information in said aggregated

5   reply packet; and

6   means for generating said proxy keep-alive reply according to said remote status table.

1   25. (Original) An aggregation device for processing an aggregated request packet,

2   wherein said aggregated request packet indicates that the status of a plurality of point-to-point

3   sessions are requested, said aggregation device comprising:

4   means for examining said aggregated request packet to determine said plurality of

5   point-to-point sessions;

6   means for determining the status of each of said plurality of point-to-point sessions;

7   means for generating an aggregated reply packet indicating the status of said plurality

8   of point-to-point sessions; and

9   means for sending said aggregated reply packet to said peer aggregation device.

1   26. (Original) The aggregation device of claim 25, wherein said means for

2   determining comprises means for accessing a local status table which contains the status

3   information of at least some of said plurality of point-to-point sessions.

1   27. (Original) The aggregation device of claim 25, wherein said means for generating

2   includes a client magic number associated with each of said plurality of point-to-point

3   sessions.

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1   28. (Original) The aggregation device of claim 25, wherein said means for generating

2   sets a bit in said aggregated reply packet to one logical value to indicate that a corresponding

3   one of said plurality of sessions is OK/alive, and to another logical value to indicate that said

4   corresponding one of said plurality of session not OK/alive.

1   29. (Original) The aggregation device of claim 25, wherein said aggregation device

2   comprises one of a network access server (NAS) and a home gateway implemented in a

3   communication network.

1   30. (Original) An aggregation device for processing an aggregated request packet,

2   wherein said aggregated request packet indicates that the status of a plurality of point-to-point

3   sessions are requested, said aggregation device comprising:

4   an input interface receiving said aggregated request packet;

5   a de-encapsulator examining said aggregated request packet to determine that said

6   aggregated request packet relates to requesting the status of point-to-point sessions;

7   a reply generator determining the status of each of said plurality of point-to-point

8   sessions, and generating an aggregated reply packet indicating the status of said plurality of

9   point-to-point sessions; and

10   an output interface sending said aggregated reply packet to said peer aggregation

11   device.

1   31. (Original) The aggregation device of claim 30, further comprising a local status

2   table storing the status information of at least some of said plurality of point-to-point sessions,

3   wherein said reply generator determines the status of said at least some of said plurality of

4   point-to-point sessions by accessing said local status table.

1   32. (Original) The aggregation device of claim 31, further comprising a session

2   manager updating the status of said plurality of point-to-point sessions in said local status

3   table.

1   33. (Original) The aggregation device of claim 30, wherein said reply generator

2   includes in said aggregated reply packet a client magic number associated with each of said

3   plurality of point-to-point sessions.

1   34. (Original) The aggregation device of claim 30, wherein said reply generator sets

2   a bit in said aggregated reply packet to one logical value to indicate that a corresponding one

3   of said plurality of sessions is OK/alive, and to another logical value to indicate that said

4   corresponding one of said plurality of session not OK/alive.

1   35. (Original) The aggregation device of claim 30, further comprising a keep-alive

2   processor coupled to said de-encapsulator, wherein said keep-alive processor examines said

3   aggregated request packet to determine that status of point-to-point sessions is requested and

4   causes said reply generator to generate said aggregated reply packet.

1   36. (Original) The aggregation device of claim 30, wherein said aggregation device

2   comprises one of a network access server (NAS) and a home gateway implemented in a

3   communication network.

1   37. (Original) A computer-readable medium carrying one or more sequences of

2   instructions for causing a aggregation device to process a plurality of keep-alive messages

3   generated by a corresponding plurality of end systems, each of said plurality of keep-alive

4   messages being designed to request the status of a corresponding point to point (PPP) session

5   implemented on a communication network, wherein execution of said one or more sequences

6   of instructions by one or more processors contained in said aggregation device causes said one

7   or more processors to perform the actions of:

8   receiving in an aggregation device said plurality of keep-alive messages;

9   generating in said aggregation device an aggregated request packet which indicates

10   that the status of said PPP sessions is requested; and

11   sending said aggregated request packet on said communication network to a peer

12   aggregation device.

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1   38. (Original) The computer-readable medium of claim 37, further comprising:

2   receiving said aggregated request packet in said peer aggregation device;

3   indicating the status of said plurality of sessions in an aggregated reply packet; and

4   sending said aggregated reply packet to said aggregation device.

1   39. (Original) The computer-readable medium of claim 37, further comprising

2   receiving in said aggregation device an aggregated reply packet from said peer aggregation

3   device, wherein said aggregated reply packet indicates the status of at least some of said

4   plurality of PPP sessions.

1   40. (Original) The computer-readable medium of claim 39, further comprising sending

2   a proxy keep-alive reply message to one of said plurality of end systems originating a

3   corresponding one of said keep alive-messages without waiting for said aggregated reply

4   packet.

1   41. (Original) The computer-readable medium of claim 40, further comprising:

2   maintaining a remote status table in said aggregation device, wherein said remote

3   status table indicates the status of sessions supported by said aggregation device;

4   updating said remote status table with the information in said aggregated reply packet;

5   and

6   generating said proxy keep-alive reply according to said remote status table.

1   42. (Original) A computer-readable medium carrying one or more sequences of

2   instructions for causing an aggregation device to process an aggregated request packet,

3   wherein said aggregated request packet indicates that the status of a plurality of point-to-point

4   sessions are requested, wherein execution of said one or more sequences of instructions by

5   one or more processors contained in said aggregation device causes said one or more

6   processors to perform the actions of:

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7   examining said aggregated request packet to determine said plurality of point-to-point

8   sessions;

9   determining the status of each of said plurality of point-to-point sessions;

10   generating an aggregated reply packet indicating the status of said plurality of point-to-

11   point sessions; and

12   sending said aggregated reply packet to said peer aggregation device.

1   43. (Original) The computer-readable medium of claim 42, wherein said determining

2   comprises accessing a local status table which contains the status information of at least some

3   of said plurality of point-to-point sessions.

1   44. (Original) The computer-readable medium of claim 42, wherein said generating

2   comprises including a client magic number associated with each of said plurality of point-to-

3   point sessions.

1   45. (Original) The computer-readable medium of claim 42, wherein said generating

2   comprises setting a bit to one logical value to indicate that a corresponding one of said

3   plurality of sessions is OK/alive, and to another logical value to indicate that said

4   corresponding one of said plurality of session not OK/alive.

1   46. (Original) The computer-readable medium of claim 42, wherein said aggregation

2   device comprises one of a network access server (NAS) and a home gateway implemented in

3   a communication network.

1   47. (Original) A communication network comprising:

2   a first aggregation device receiving a plurality of keep-alive messages generated by a

3   corresponding plurality of end systems, each of said plurality of keep-alive messages being

4   designed to request the status of a corresponding point to point (PPP) session implemented

5   on said communication network, said first aggregation device generating an aggregated

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6   request packet which indicates that the status of said PPP sessions is requested, and sending

7   said aggregated request packet; and

8   a peer aggregation device receiving said aggregated request packet and indicating the

9   status of said plurality of sessions in an aggregated reply packet, said peer aggregation packet

10   sending said aggregated reply packet to said first aggregation device.

1   48. (Original) The communication network of claim 47, wherein said first aggregation

2   device is located at an edge of said communication networks.

1   49. (Original) The communication network of claim 48, further comprising an access

2   network coupling said first aggregation device to said corresponding plurality of end systems,

3   wherein said plurality of keep-alive messages are received on said access network.

1   50. (Original) The communication network of claim 49, wherein said first aggregation

2   device and said peer aggregation device respectively comprise a network access server (NAS)

3   and a home gateway.

1   51. (New) The method of claim 1, wherein said aggregation device is in the path of

2   all of said plurality of PPP sessions.

1   52. (New) The method of claim 10, wherein said aggregation device is in the path of

2   all of said plurality of PPP sessions.

1   53. (New) The invention of claim 15, wherein said aggregation device is in the path

2   of all of said plurality of PPP sessions.

1   54. (New) The invention of claim 21, wherein said aggregation device is in the path

2   of all of said plurality of PPP sessions.

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1   55. (New) The invention of claim 25, wherein said aggregation device is in the path
2   of all of said plurality of PPP sessions.

1   56. (New) The invention of claim 30, wherein said aggregation device is in the path
2   of all of said plurality of PPP sessions.

1   57. (New) The computer readable medium claim 37, wherein said aggregation device
2   is in the path of all of said plurality of PPP sessions.

1   58. (New) The computer readable medium claim 42, wherein said aggregation device
2   is in the path of all of said plurality of PPP sessions.